

# Performance Measurement State of the Practice

*presented to*

**Commonwealth of Virginia**  
**Transportation Accountability Commission**  
**Outcome Measures Subcommittee**

*presented by*

**Lance A. Neumann**  
**Cambridge Systematics, Inc.**

**February 22, 2007**

**Transportation leadership you can trust.**

# Agenda

- **Performance Measurement Trends**
- **Uses of Performance Measures**
- **System Measurement Areas**
- **Selected Examples**
- **Performance Targets and Peer Comparisons**
- **Conclusions**

# Performance Measurement Trends

- **Transportation agencies have used a variety of performance measures for years**
- **Over the past 10 years “performance management” as an accepted and expected management practice has emerged**
- **Key tool to establish/maintain credibility and accountability**
- **Provides opportunity to communicate to various stakeholders**

# Performance Measurement Trends (continued)

- **Focus of most efforts**
  - Performance of the system
  - Performance of the agency
  - Program delivery
  - Customer satisfaction

# Uses of Performance Measures

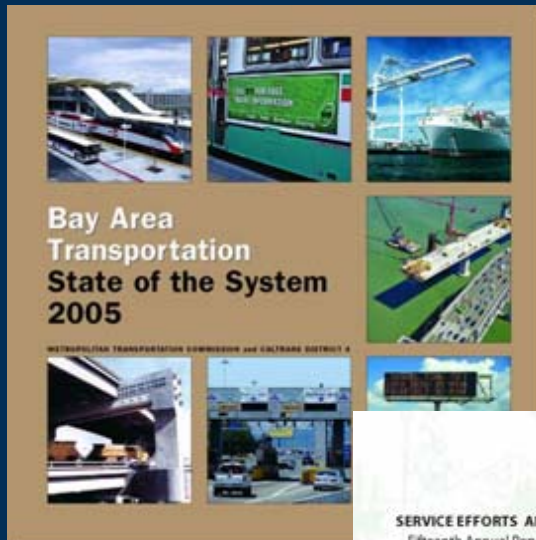
- **Defining goals in long-range plans and programs**
- **Periodic performance reporting “state-of-the-state” or region**
- **Real-time reporting of system conditions**
- **Guiding resource allocation and budgeting decisions**
- **Driving results throughout an agency**

# System Measurement Areas

- **Physical condition of infrastructure, vehicles, and equipment**
- **System usage**
- **System service levels**
  - Travel time
  - Delay
  - Reliability
- **System operations**
  - Time to clear incidents
  - Percent “on-time”
  - Fleet availability
- **Safety**
- **Customer satisfaction**

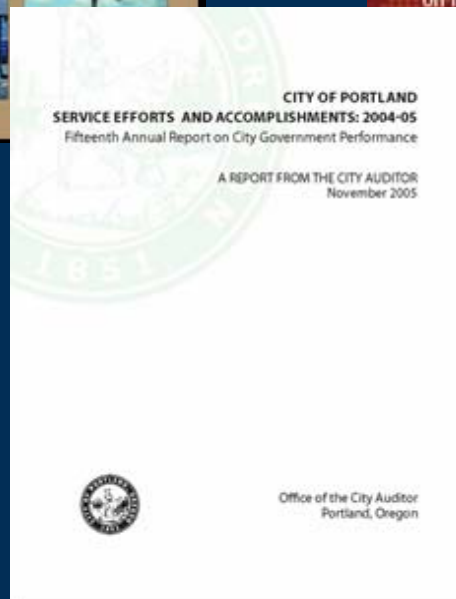
# Selected Examples

# Performance Reports

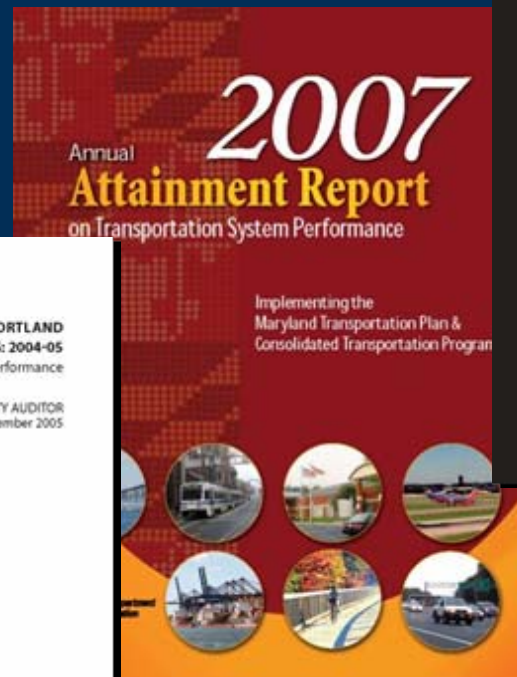


*State of the System 2005*  
Bay Area Transportation

*Good to Great*  
*Strategic Plan and Annual Report*  
New Mexico DOT



*Service Efforts and Accomplishments*  
City of Portland, Oregon

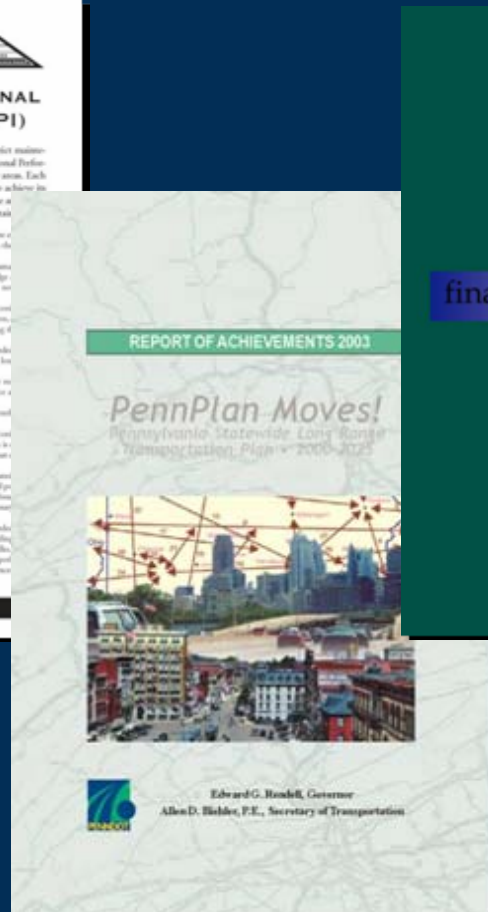


*2007 Annual Attainment Report*  
Maryland DOT

# Performance Reports (continued)



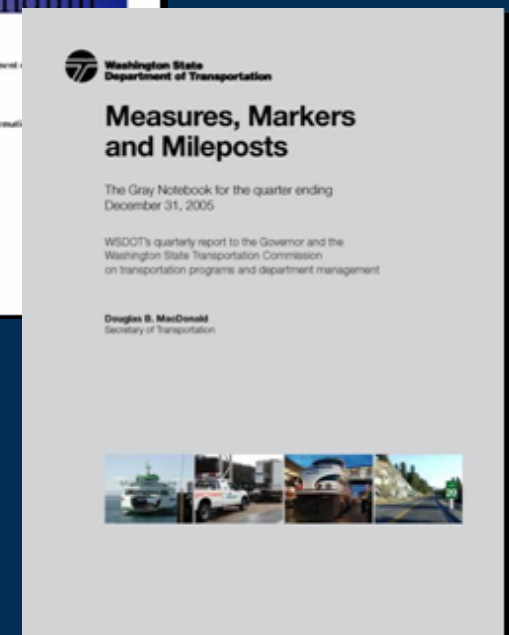
**ODOT Business Plan 2004 & 2005**  
Ohio Department of Transportation



**PennPlan Moves! Report of Achievements 2003**  
Pennsylvania Department of Transportation

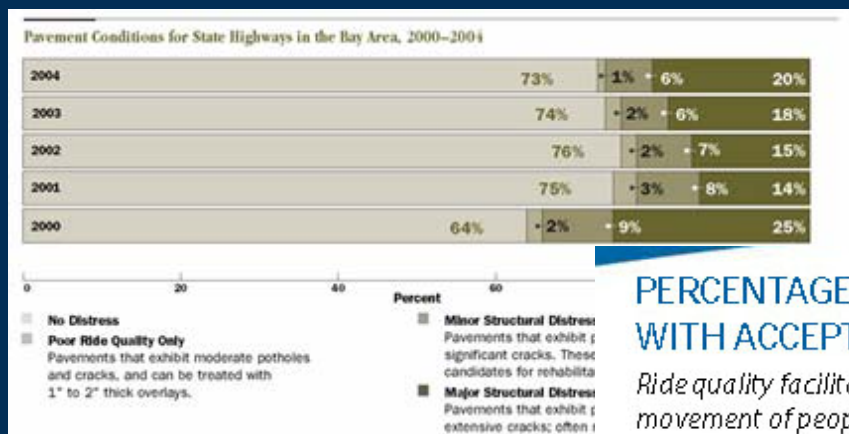


**Final Technical Memorandum**  
**Task 10 – Performance**  
**Factors and Measures**  
Cambridge Systematics, Inc.  
for the Arizona Department  
of Transportation



**Measures, Markers and Mileposts**  
Washington State Department of Transportation

# Pavement and Bridge Condition



State of the System 2005  
Bay Area Transportation

## PERCENTAGE OF SHA ROADWAY MILEAGE WITH ACCEPTABLE RIDE QUALITY

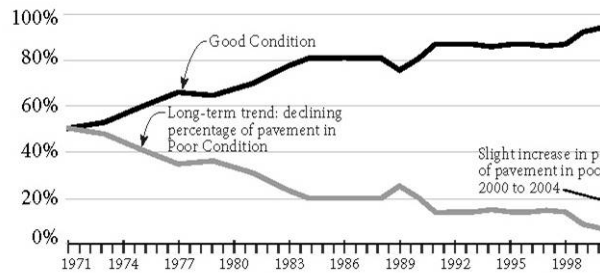
*Ride quality facilitates mobility, efficiency, and safe movement of people and goods within Maryland.*



2007 Annual Attainment Report  
Maryland DOT

# Pavement and Bridge Condition (continued)

## Pavement Condition Trends Percent of Pavements



Source: WSDOT Materials Lab

## Asset Management: Pavement Assessment Annual Update

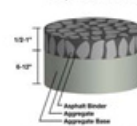
### Basic Pavement Types and Ratings Summary

#### Pavement Types

##### Chip Seals

Asphalt is sprayed on the road surface and covered with a layer of rock chips, creating a flexible surface. As the asphalt cools it becomes solid. Chip seals are appropriate for roads that carry fewer than 1,000 vehicles and 100 trucks per day. Chip-sealed roads are typically rural and have six to eight years of performance life. It is often cost effective to combine small projects into larger, regional projects.

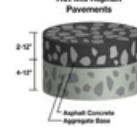
##### Chip Seal Pavements



##### Hot Mix Asphalt (HMA)

HMA is a flexible surface, often used on roads with traffic volumes greater than 2,000 vehicles per day. Average western Washington HMA pavement life is 16.5 years; in eastern Washington it is 11.3 years due to seasonal temperatures. The state average is 14.7 years.

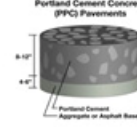
##### Hot Mix Asphalt Pavements



##### Portland Cement Concrete (PCC)

Existing PCC pavement life ranges from 25 to 45 years. PCC pavement is a rigid surface, typically placed on heavily traveled interstates, principal arterials and interchanges.

##### Portland Cement Concrete (PCC) Pavements



#### Pavement Ratings

WSDOT uses a combination of pavement ratings shown below to determine when pavement is due for rehabilitation, based on Lowest Life Cycle Cost (LLCC) management.

##### Pavement Structural Condition (PSC)

A pavement will develop structural deficiencies for two reasons: truck traffic and cold weather. The PSC is a measure based on distress, such as cracking and rutting, which relates to the pavement's ability to carry loads. PSC ranges from 100 (best condition) to 0 (worst condition). A roadway should be considered for rehabilitation when it falls within the PSC range of 40 to 60.



Pavement Structural Condition example

##### Rutting

Rutting is caused by heavy truck traffic or steady tire wear. Ruts deeper than 1/2 inch have the potential to hold water, increasing the risk of hydroplaning for high-speed traffic. A roadway should be rehabilitated when the rut depth is greater than 1/2 inch.



Rutting example

##### Roughness

The International Roughness Index (IRI) is a procedure to measure pavement ride. A full-sized van, with a laser-measuring device mounted on the front bumper, measures the roughness of the pavement. A roadway should be rehabilitated when the IRI value is between 70 and 120 inches per mile.



Roughness example

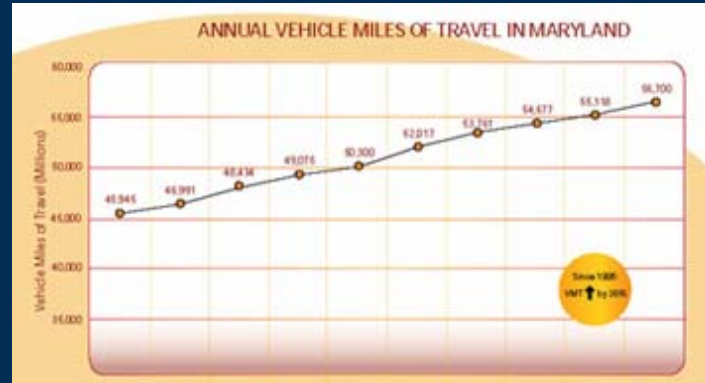
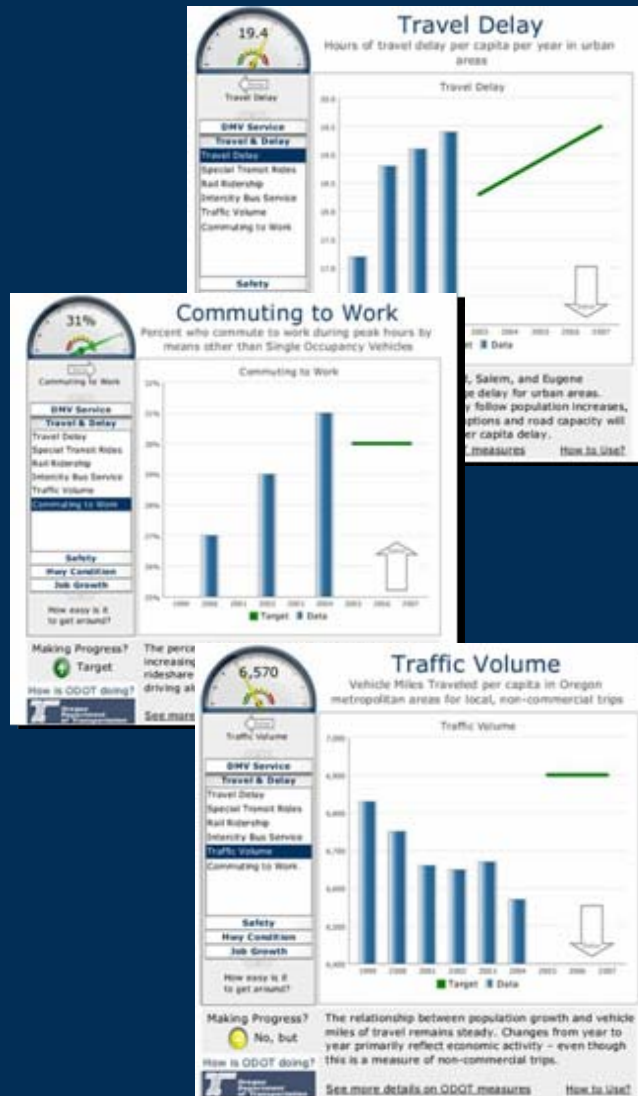
#### Pavement Management at Lowest Life Cycle Cost (LLCC)

The basic management principles behind LLCC are rather simple: if rehabilitation is done too early, pavement life is wasted; if rehabilitation is done too late, very costly repair work may be required, especially if the underlying structure is compromised. WSDOT continually looks for ways to balance these basic principles while making adjustments to traditional paving practices.

Measures, Markers and Mileposts - December 31, 2005

GNS | 39

# Traffic Congestion and Delay



2007 Annual Attainment Report  
Maryland DOT

# Operations

## Greetings from MoDOT

The Missouri Department of Transportation is committed to being open and transparent. We want you to know what we do well, what we don't do so well and what we are doing to get better. That is why we created the Tracker.

This document is your window into MoDOT – warts and all. It invites you to hold us accountable for exceeding your expectations. You expect MoDOT to get the best value out of every dollar spent. You expect us to make highways smoother and safer, soon. You expect us to fix bad bridges, be responsive and to proactively give you the information you need. You expect us to provide a world-class transportation experience.

We share your expectations and have built 18 tangible results around them. These results guide us everyday as we go about the business of delighting our customers. In the Tracker, you will see that we have established measures to gauge our progress and we are comparing ourselves to the best organizations in the country.

You can use the Tracker to see how we are measuring up. We make it available in a printed format and on our website at [www.modot.org](http://www.modot.org). Missouri's transportation system will not improve unless we all work together. The Tracker is one of the many ways you can help. Please look it over and let us know how we are doing.

Sincerely,

### Mission

*Our mission is to provide a world-class transportation experience that delights our customers and promotes a prosperous Missouri.*



## Tangible Results

- Uninterrupted Traffic Flow
- Smooth and Unrestricted Roads and Bridges
- Safe Transportation System
- Roadway Visibility
- Personal, Fast, Courteous and Understandable Response to Customer Requests (Inbound)
- Partner With Others to Deliver Transportation Services
- Leverage Transportation to Advance Economic Development
- Innovative Transportation Solutions
- Fast Projects That Are of Great Value
- Environmentally Responsible
- Efficient Movement of Goods
- Easily Accessible Modal Choices
- Customer Involvement in Transportation Decision-Making
- Convenient, Clean and Safe Roadside Accommodations
- Best Value for Every Dollar Spent
- Attractive Roadside
- Advocate for Transportation Issues
- Accurate, Timely, Understandable and Proactive Transportation Information (Outbound)

## Value Statements

MoDOT will -

- support and develop employees because we believe they are the key to our success.
- be flexible because we believe one size does not fit all.
- honor our commitments because we believe in integrity.
- encourage risk and accept failure because we believe in getting better.
- be responsive and courteous because we believe in delighting our customers.
- empower employees because we trust them to make timely and innovative decisions.
- not compromise safety because we believe in the well-being of employees and customers.
- provide the best value for every dollar spent because we're taxpayers too.
- value diversity because we believe in the power of our differences.
- be one team because we all share the same mission.
- use teamwork because it produces the best results.
- foster an enjoyable workplace because we care about each other and our mission.
- be open and honest because we must be trustworthy.
- listen and seek to understand because we value everyone's opinion.
- treat everyone with respect because we value their dignity.
- seek out and welcome any idea that increases our options because we don't have all the answers.
- always strive to do our job better, faster, and cheaper because we want to meet more of Missouri's needs.

**TRACKER**  
Missouri DOT

# Operations (continued)

## TRACKER Table of Contents

Uninterrupted Traffic Flow – Don Hillis (Page 1)	
Average speeds on selected roadway sections	Troy Pinkerton 1a
Average time to clear traffic incident	Rick Bennett 1b
Average time to clear traffic backup from incident	Rick Bennett 1c
Number of customers assisted by the Motorist Assist program	Rick Bennett 1d
Percent of Motorist Assist customers who are satisfied with the service	
Percent of signals observed	
Percent of reform signals	
Percent of work zones meeting expectations for traffic flow	
Time to meet winter storm event performance objectives on major highways	
Smooth and Unrestricted Roads and Bridges – Kevin Keith (Page 2)	
Percent of major highways that are in good condition	
Percent of minor highways that are in good condition	
Percent of deficient bridges on major highways	
Percent of deficient bridges on minor highways	
Number of deficient bridges on the state system (major & minor highways)	
Number of miles completed through the Smooth Roads Initiative	
Safe Transportation System – Don Hillis (Page 3)	
Number of fatalities and disabling injuries	
Number of impaired driver-related fatalities and disabling injuries	
Rate of annual fatalities and disabling injuries	
Percent of safety belt/passenger vehicle restraint use	
Number of bicycle and pedestrian fatalities and disabling injuries	
Number of motorcycle fatalities and disabling injuries	
Number of commercial motor vehicle crashes resulting in fatalities	
Number of commercial motor vehicle crashes in work zones	
Number of highway-rail crossing fatalities and collisions	
Roadway Visibility – Don Hillis (Page 4)	
Rate of nighttime crashes	
Percent of signs that meet customers' expectations	
Percent of stripes that meet customers' expectations	
Percent of work zones meeting expectations for visibility	
Personal, Fast, Courteous and Understandable Response to Customer Requests (Inbound) – Shane Peck (Page 5)	
Percent of overall customer satisfaction	
Percent of customers who contacted MoDOT that felt they were responded to quickly and courteously with an understandable response	
Percent of documented customer requests responded to within 24 hours	
Average completion time on requests requiring follow up	
Partner With Others to Deliver Transportation Services – Kevin Keith (Page 6)	
Number of dollars of discretionary funds allocated to Missouri	
Percent of earmarked dollars that represent MoDOT's high priority highway projects	
Number of dollars generated through cost-sharing and other partnering agreements	
Leverage Transportation to Advance Economic Development – Roberta Broeker (Page 7)	
Number of miles of new 4-lane corridors completed	
Percent utilization of SIB & STAB loan programs	
Rate of economic return from transportation investment	
Innovative Transportation Solutions – Mara Campbell (Page 8)	
Percent of innovative transportation solutions implemented	
Number of external awards received	

## TRACKER Table of Contents (cont.)

Fast Projects That Are of Great Value – Dave Nichols (Page 9)	
Percent of estimated project cost as compared to final project cost	Kerette Wilkinson 9a
Average number of years it takes to go from the programmed commitment in the Statewide Transportation Improvement Program to construction completion	Machelle Watkins 9b
Percent of projects completed within programmed amount	Dave Ahlvers 9c
Percent of projects completed on time	Dave Ahlvers 9d
Percent of change for finalized contracts	Dave Ahlvers 9e
Average construction cost per day by contract type	Dave Ahlvers 9f
Unit cost of construction expenditures	Travis Koestner 9g
Annual dollar amount saved by implementing value engineering	Kathy Harvey 9h
Dollar amount saved by implementing practical design	Kathy Harvey 9i
Percent of customers who feel completed projects are the right transportation solutions	Kathy Harvey 9j
Environmentally Responsible – Dave Nichols (Page 10)	
Percent of projects completed without environmental violation	Kathy Harvey 10a
Number of projects MoDOT protects sensitive species or restores habitat	Gayle Uhrh 10b
Ratio of acres of wetlands created compared to the number of acres of wetlands impacted	Gayle Uhrh 10c
Percent of air quality days that meet Environmental Protection Agency standards by metropolitan area	Eric Curbitt 10d
Percent of alternative fuel consumed	Dave DeWitt 10e
Number of historic resources avoided or protected as compared to those mitigated	Bob Reeder 10f
Number of tons of recycled/waste materials used in construction projects	Joe Schroer 10g
Efficient Movement of Goods – Dave DeWitt (Page 11)	
Freight tonnage by mode	
Average travel speeds for trucks on selected roadway sections	
Percent of trucks using advanced technology at Missouri weigh stations	
Interstate motor carrier mileage	
Percent of satisfied motor carriers	
Customer satisfaction with timeliness of Motor Carrier Services response	
Easily Accessible Modal Choices – Brian	
Number of airline passengers	
Number of rail passengers	
Number of transit passengers	
Number of passengers and vehicles transported by ferryboat	
Number of days the Missouri River is navigable	
Number of business-capable airports	
Number of daily scheduled airline flights	
Average number of days per week rural transit service is available	
Number of intercity bus stops	
Percent of customers satisfied with transportation options	
Customer Involvement in Transportation Decision-Making	
Number of customers who attend transportation-related meetings	
Percent of customers who are satisfied with feedback they receive from MoDOT comments	
Percent of customers who feel MoDOT includes them in transportation decision-making	
Percent of positive feedback responses received from planning partners regarding transportation decision-making	
Convenient, Clean & Safe Roadside Accommodations	
Percent of customers satisfied with rest areas' convenience, cleanliness and safety	
Percent of customers satisfied with commuter lots' convenience, cleanliness and safety	
Number of users of rest areas	
Number of users of commuter parking lots	
Number of truck customers that utilize rest areas	

## TRACKER Table of Contents (cont.)

Best Value for Every Dollar Spent – Roberta Broeker (Page 15)	
Number of MoDOT employees (converted to full-time equivalency)	Hicki Knudsen 15a
Percent of work capacity based on average hours worked	Hicki Knudsen 15b
Rate of employee turnover	Hicki Knudsen 15c
Percent of satisfied employees	Hicki Knudsen 15d
Number of lost workdays per year	Beth King 15e
Rate and total of OSHA recordable incidents	Beth King 15f
Unit cost per square foot of buildings	Chris DeVore 15g
Fleet expenses compared to fleet value	Jeanne Wilson 15h
Dollars expended on consultants other than program consultants	Debbie Rickard 15i
Percent of vendor invoices paid on time	Debbie Rickard 15j
Average cost of subcontract design and bridge engineer vs. full costed full-time employee	Debbie Rickard 15k
Distribution of expenditures	Debbie Rickard 15l
Percent variance of state revenue projections	Ben Reaser 15m
MoDOT national ranking in revenue per mile	Ben Reaser 15n
Attractive Roadways – Don Hillis (Page 16)	
Percent of roadways that meet customers' expectations	Jim Carney 16a
Number of miles in Adopt-A-Highway program	Stacy Armstrong 16b
Advocate for Transportation Issues – Pete Rahn (Page 17)	
Percent of minorities and females employed	Brenda Treadwell-Martin 17a
Percent of transportation-related pieces of legislation directly impacted by MoDOT	Pam Harlan 17b
Percent of federal roadway earmarked projects on the state highway system	Kent Van Landuyt 17c
Percent of customers who view MoDOT as Missouri's transportation expert	Jay Wunderlich 17d
Accurate, Timely, Understandable and Proactive Transportation Information (Outbound) – Shane Peck (Page 18)	
Number of public appearances	Sally Overlander 18a
Percent of customers who feel MoDOT provides timely, accurate and understandable information	Sally Overlander 18b
Number of contacts initiated by MoDOT to media	Jeff Briggs 18c
Percent of MoDOT information that meets the media's expectations	Jeff Briggs 18d
Percent of positive newspaper editorials	Jeff Briggs 18e
Number of repeat visitors to MoDOT's web site	Hert Hebert 18f

Please Note: Tangible Results are listed in reverse alphabetical order, not by importance.

# Operations (continued)

## Primary Response Reasons by Clearance Time

### Incidents Lasting Less Than 15 Minutes (7,668)

There were 6 Fires and 2 Hazardous Materials involved incidents in addition to or as a result of above incidents.

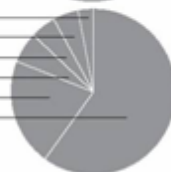
Non-Injury Collisions 3%  
Other 4%  
Debris 10%  
Abandoned Vehicles 28%  
Disabled Vehicles 54%



### Incidents Lasting 15 to 90 Minutes (4,958)

There were 44 Fires and 8 Hazardous Materials involved incidents in addition to or as a result of above incidents.

Other 3%  
Debris 5%  
Abandoned Vehicles 5%  
Injury Collisions 6%  
Non-Injury Collisions 23%  
Disabled Vehicles 60%



### Incidents Lasting 90 Minutes and Longer (213)

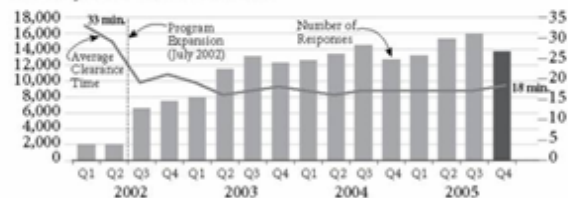
There were 8 Fires and 12 Hazardous Materials involved incidents in addition to or as a result of above incidents.

Abandoned Vehicles 1%  
Debris 3%  
Other 10%  
Disabled Vehicles 13%  
Penalty Collisions 13%  
Non-Injury Collisions 26%  
Injury Collisions 34%



## Number of Responses and Overall Average Clearance Time

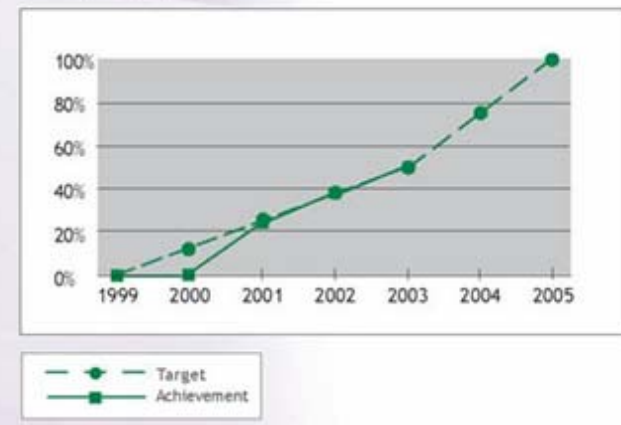
January 2002 - December 2005



Source: WSDOT Incident Response Tracking System

Note: Program-wide data is available since January 2002. Prior to Q3 of 2003, number of responses by IRT are shown. From Q3-2003, responses by Registered Tow Truck Operators and WSP Cadets have been reported in the total.

## Objective 2: Interstates Covered by Incident Management System



*PennPlan Moves! Report of Achievements 2003*  
Pennsylvania Department of Transportation

Measures, Markers and Mileposts  
Washington State Department of Transportation

# Operations (continued)

## CONDITION RATINGS: THREE ASSET GROUPS, FY 2004-05

Improved streets



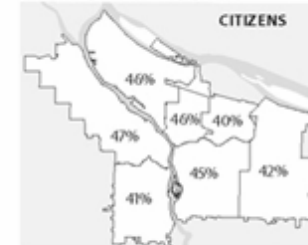
Traffic signal hardware



Street lights



## OVERALL STREET MAINTENANCE, 2005 (percent "good" or "very good")

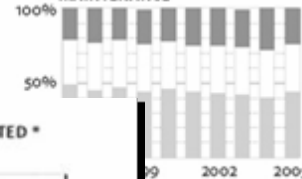


## NEIGHBORHOOD ON-STREET PARKING, 2005 (percent "good" or "very good")

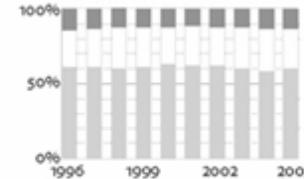


■ "bad" or "very bad"  
■ "neither"  
■ "good" or "very good"

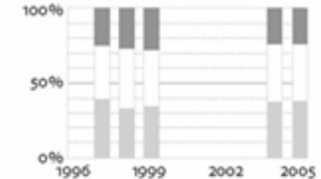
## CITIZENS: OVERALL STREET MAINTENANCE



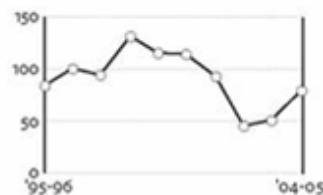
## CITIZENS: OVERALL STREET LIGHTING



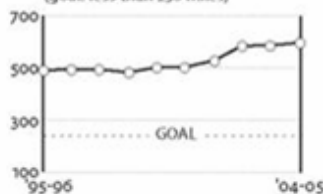
## CITIZENS: OVERALL TRAFFIC MANAGEMENT - SAFETY



## MILES OF STREETS TREATED \*



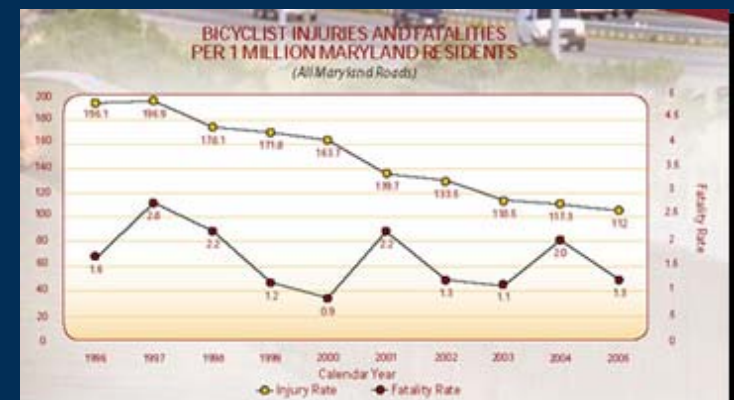
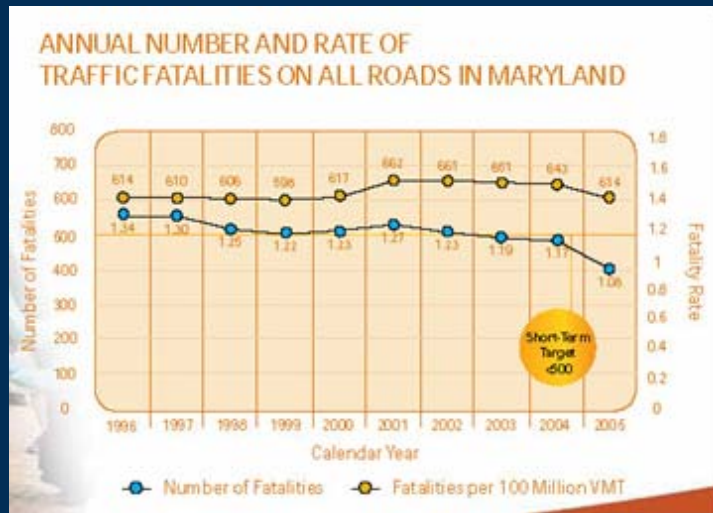
## STREET MAINTENANCE BACKLOG \* (goal: less than 250 miles)



\*28-foot-wide equivalent miles

*Service Efforts and Accomplishments*  
City of Portland, Oregon

# Safety

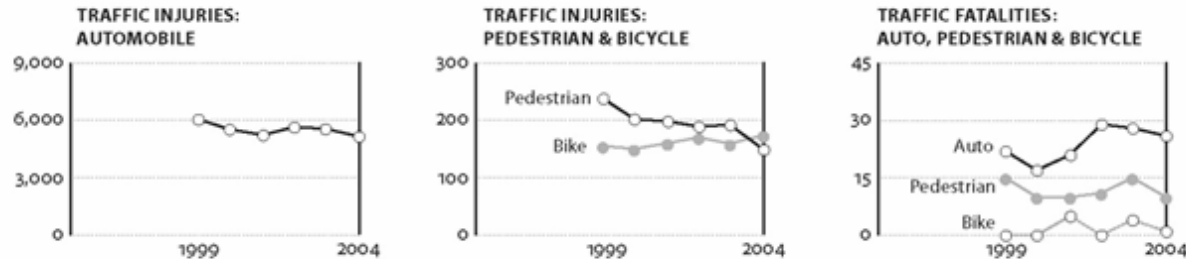


# Safety (continued)



Public Measures Report  
Oregon DOT

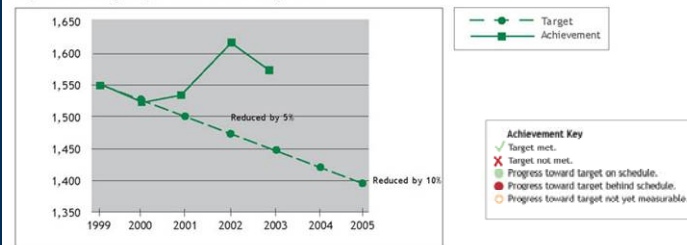
# Safety (continued)



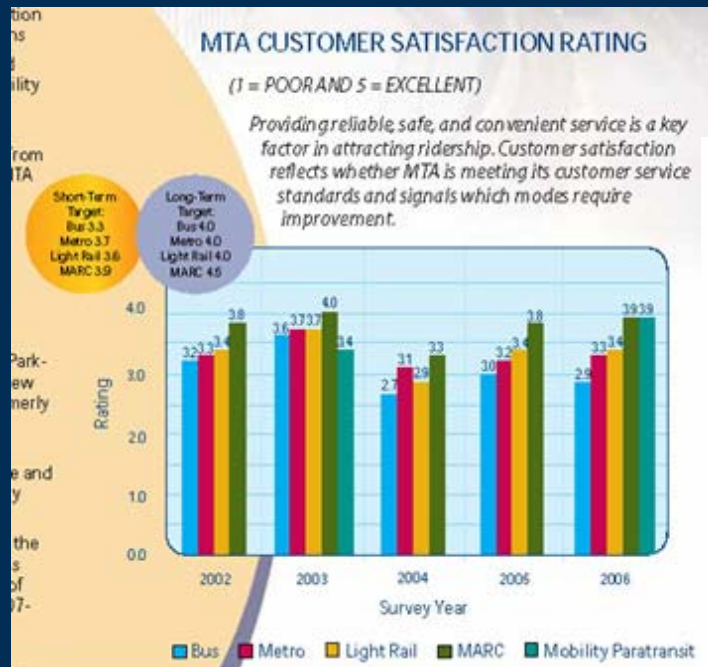
## Service Efforts and Accomplishments City of Portland, Oregon

PENNSYLVANIA STATEWIDE LONG RANGE TRANSPORTATION PLAN ACHIEVEMENTS 2003			
Objective	Performance Measure	Target	Achievement
3. Achieve the goals identified in the updated Intelligent Transportation Systems (ITS) Strategic Plan.	Number of goals achieved.	All goals achieved in a timely manner.	● Activities toward four (corrected from five) of the six goals are underway. Progress toward target on schedule.
4. Reduce the number of fatalities and severity of crashes on the state's highways.	Number of: Injuries overall. Fatalities overall. - of 16- and 17-year-old drivers/passengers. - of 65-and-older drivers/passengers. - related to drivers with revoked/suspended licenses. - related to heavy trucks. - related to buses. - Involving alcohol. - related to failure to use seat belts. - Involving pedestrians and bicyclists. - Involving motorcyclists. - In collisions with fixed objects. - In head-on collisions. - at stop-controlled and signalized intersections. - on curves.	Fatalities reduced across all categories 5 percent by 2002 and 10 percent by 2005 from base of 1,549 in 1999.	✗ 2003 fatalities totaled 1,577, which represents a 1.8-percent increase from base year total (a decrease from 1,618 fatalities in 2002). Target not met.

Objective 4: Highway Fatalities in Pennsylvania

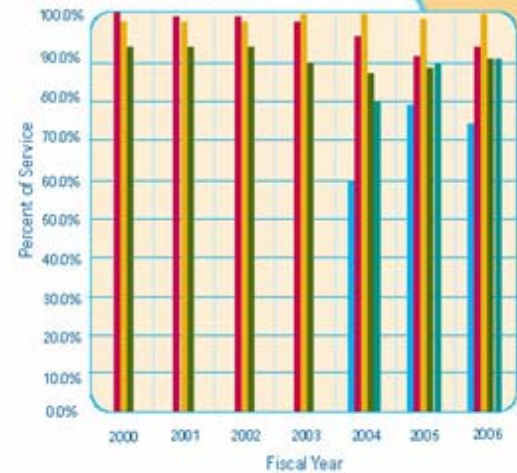


# Customer Satisfaction



## PERCENTAGE OF MTA SERVICE PROVIDED ON TIME

On-time performance is an important indicator of service quality and efficiency, and correlates highly with system usage and customer satisfaction.



- MTA Metro: Mid-life overhauls and a new maintenance building
- MARC: Begin overhaul and perform efficiency improvements
- MTA Bus: Implement computer-aided dispatching and buses on a real-time location (AVL) system
- MTA Metro: Complete protection upgrades
- MTA Light Rail: Begin

## MVA BRANCH OFF TIME VS. CUSTOMER VISIT TIME

Average customer visit time is inversely related to customer branch customer visit time increases). The branch customer visit times for Vehicle Em-

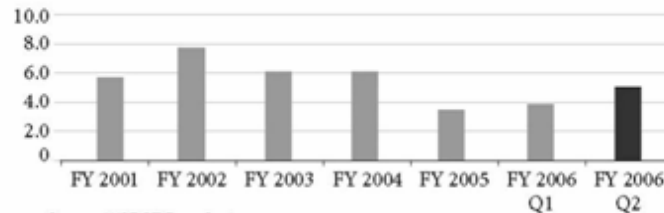
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# Customer Satisfaction (continued)

## Customer Feedback

The WSDOT Ferry System delivered approximately 41,000 trips, carried 5.5 million riders this quarter and received 350 complaints. The Ferry System reports complaints per 100,000 customers carried. This quarter experienced 6.3 complaints per 100,000 customers. This represents a 28% increase in complaints from the preceding quarter and an 84% increase from the same period last year. Fiscal Year (FY) 2006 Second Quarter covers the period October through December 2005.

### Total Number of Complaints per 100,000 Customers

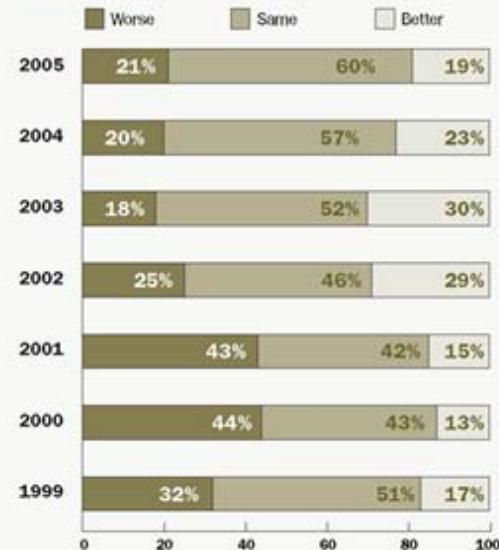


Source: WSDOT Ferry System

## Measures, Markers and Mileposts

Washington State Department of Transportation

### Commuter Perceptions: Percent of Commuters Who Say Their Commute Is Better or Worse Than Last Year



Source: MTC Regional Rideshare Program

State of the System 2005  
Bay Area Transportation

# What About Virginia?

- Virginia has been a lead state in adopting performance measures
- Virginia DASHBOARD widely cited as example of best practice
- Presentations to the Accountability Commission in January demonstrated strong capability in all departments
- Virginia Transportation Performance Report covers most key measurement areas



# Performance Targets and Peer Comparisons

- **Setting performance targets**
  - Can't do in the abstract must relate to resources available
  - Easiest when agency controls performance factor
- **Benchmarking and peer comparisons**
  - Historically a sensitive area
  - Every agency perceives they are “unique”
  - Can't avoid peer comparisons and it's better to control agenda

# Performance Targets and Peer Comparisons (continued)

- **National databases**

- **Highway Performance Monitoring System (HPMS)**
- **National Transit Database (NTD)**
- **National Bridge Inspections (NBI)**
- **Fatal Accident Reduction System (FARS)**

- **National performance efforts**

- **National Transportation Operations Coalition (NTOC)**
- **AASHTO Standing Committee on Quality**
- **I-95 Corridor Coalition**
- **Texas Transportation Institute Congestion Index**
- **David Hartgen's Reports State DOT Performance**

# Conclusions

- **Defining, tracking, and reporting on a broad range of transportation performance measures is the state of the practice**
- **Focus of different agency efforts varies widely**
- **Many examples and resources are available**
- **Virginia is a lead state though there are always areas for improvement**